The opinion in support of the decision being entered today is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte MICHAEL P. CAREN, HERBERT F. CATTELL, RICHARD P. TELLA, PETER G. WEBB, and JAY K. BASS

Appeal 2007-1007
Application 09/302,898
Technology Center 1600

Decided: September 28, 2007

Before TONI R. SCHEINER, LORA M. GREEN, and NANCY J. LINCK, *Administrative Patent Judges*.

LINCK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a 35 U.S.C. § 134 appeal in the above-referenced case.[1]

We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

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[1] The application was filed April 30, 1999. The real party in interest is Agilent Technologies, Inc.

STATEMENT OF THE CASE

The field of the invention is polynucleotide array fabrication. According to Appellants: "Polynucleotide arrays (such as DNA or RNA arrays) are known . . . . Such arrays include regions (sometimes referenced as spots or features) of usually different sequence polynucleotides arranged in a predetermined configuration on a substrate." (Specification ("Spec.") 1, ll. 11-14.) Further, according to Appellants, "the quantities of DNA available for the array are usually very small and expensive," so ready detection of spot errors would be "useful" (Spec. 2, l. 24 to 3, l. 5).

Given this background, Appellants' claimed invention focuses on "spot position errors or other spot errors" (Spec. 3, ll. 9-10) and "provides a method for fabricating an array of polynucleotides on a substrate" using "[a]ny device or apparatus which can be used to deposit droplets in an array" (Spec. 3, ll. 27-31). "The target pattern is an aim or desired pattern" (*id.* at 3, l. 32). The "droplets deposited by the system will have dried to yield an actual pattern of dried spots" which is then "compared with the target pattern" (Spec. 4, ll. 1-6).

The claimed subject matter is reflected in the following independent claims (emphasis added to highlight disputed limitations):

> 1. A method of fabricating an array of polynucleotides on a substrate, comprising:
>
> (a) operating a polynucleotide deposition system to deposit an array of polynucleotide containing fluid droplets on the substrate in accordance with *a target array pattern determined by a processor in communication with the deposition system*;

(b) *allowing a sufficient time to pass such that droplets deposited by the system will have dried to yield an actual pattern of dried spots*; and

(c) observing the actual pattern; and

(d) comparing the actual pattern with the target pattern.

18. A method of fabricating an array of polynucleotides on a substrate, comprising:

(a) operating a polynucleotide deposition system to deposit an array of polynucleotide containing fluid droplets on the substrate in accordance with a target array pattern determined by a processor in communication with the deposition system which may differ from the actual pattern deposited;

(b) capturing an image of the actual pattern;

(c) comparing the actual pattern with the target pattern;

(d) when the results of one or more comparisons for an array identify the presence of a first level error, generating a first level error indication associated with the array;

(e) writing the error indication or an identification of the error indication, on a medium; physically associating the medium with the array; and, when an identification of the error indication is written on the medium, storing the identification in a memory in association with the error indication; and

(f) *forwarding the array and medium to a remote user.*

25. An apparatus for fabricating an array of polynucleotides on a substrate, comprising:

(a) a polynucleotide deposition system to deposit an array of polynucleotide containing fluid droplets on the substrate in accordance with a target array pattern determined by a processor in communication with the deposition system;

(b) *an imaging system to capture an image of an actual pattern of dried spots resulting from drying of droplets deposited on the substrate*;

(c) a processor to control the deposition system to deposit the array of droplets and which, after a predetermined time has elapsed for drying of the droplets to yield the actual pattern, causes the imaging system to capture the actual pattern and compares actual pattern with the target pattern.

39. An apparatus for fabricating an array of polynucleotides on a substrate, comprising:

(a) a polynucleotide deposition system to deposit an array of polynucleotide containing fluid droplets on the substrate in accordance with a target array pattern determined by a processor in communication with the deposition system which may differ from the actual pattern deposited;

(b) *an imaging system to capture an image of the actual pattern of spots*;

(c) a processor to control the deposition system to deposit the array of droplets and which causes the imaging system to capture the actual pattern and compares the actual pattern with the target pattern;

wherein:

the deposition system includes a head retainer to receive a fluid dispensing head, and includes a transporter to move the head retainer relative to the substrate;

the imaging system includes a light receiving element mounted for movement by the transporter.

46. An apparatus wherein the polynucleotide deposition system includes a fluid dispensing head with multiple drop dispensers and a control processor, wherein *the control processor:*
loads the dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid;

> performs the comparisons of the actual and target patterns and, when the results of one or more comparisons for an array exceed a predetermined tolerance, generates an error indication; and
> when an error indication is generated, operating the drop dispensers to correct for the error.

The Examiner has rejected claims 1-18 and 20-48 under 35 U.S.C. § 103(a) based on Baldeschwieler, U.S. Patent No. 6,015,880 (issued Jan. 18, 2000) and Weber, U.S. Patent No. 4,328,504 (issued May 4, 1982).

Additionally, the Examiner has rejected claims 1-18 and 21-48 under 35 U.S.C. §102(a), or in the alternative under § 103(a) based on Graves et al., 70 Anal. Chem. 5085-92 (1998).[2]

The § 103(a) Rejection Based on Weber and Baldeschwieler

The Issues

With respect to the § 103(a) rejection based on Weber and Baldeschwieler, Appellants argue the following limitations are not taught or suggested by these references:

(1) In method claims 1-18, 20-24, 41, and 43-45, "allowing a sufficient time to pass such that droplets deposited by the system will have dried to yield an actual pattern of dried spots" and "comparing the actual pattern [of dried spots] with the target pattern" (*see* Appeal Br. 14[3]);

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[2] In her Answer, the Examiner withdrew the rejection of claim 20 based on Graves (Answer 12).

[3] Claim 18 does not recite "dried spots;" however, we've left this grouping to reflect that of Appellants.

(2) In method claim 10, in addition to the "dried spots" limitation, "imaging a light scattering characteristic of dried spots" (Appeal Br. 19);

(3) In method claim 11, in addition to the "dried spots" limitation, "imaging a fluorescence characteristic of dried spots" (Appeal Br. 19-20);

(4) In method claim 20, in addition to the "dried spots" limitation, "automatically halting further operation of the deposition system" when an "error condition" is detected (Appeal Br. 21-22);

(5) In method claims 23 and 43-45, in addition to the "dried spots" limitation, "the control processor loading the dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid" (Claim 23; Appeal Br. 21);

(6) In method claim 24, in addition to the "dried spots" limitation, "altering the initial pattern" such that a dispenser identified as faulty "is not used" (Appeal Br. 22);

(7) In apparatus claims 25-38 and 42, "an apparatus . . . comprising an imaging system to capture an image of an actual pattern of dried spots" (Appeal Br. 18);

(8) In apparatus claims 39 and 40, "the imaging system includes a light receiving element mounted for movement by the transporter" (Appeal Br. 22-23); and

(9) In apparatus claims 46-48, an apparatus "wherein the control processor loads the dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid" (Appeal Br. 23-24).

In addition to disputing the teaching or suggestion of the above limitations, Appellants argue Weber is non-analogous art (Appeal Br. 12, 14-15) "because printing ink onto paper is so completely different from

depositing chemical reagents onto a substrate to make microarrays" (*id.* at 15), and thus "is not properly combinable with Baldeschwieler" (*id.*).

Appellants further argue the cited prior art did not recognize the specific problem arising when an actual array pattern and the target array pattern are different "due to errors arising during the manufacture process" (Appeal Br. 16). Appellants claim to be "the first to recognize" this specific problem and to solve it (*id.*). And, according to Appellants, "[w]ithout knowledge of the problem, there would have been no need to combine the documents, the expense of making the combination would be high, and there would have been no expected benefit to making the combination" (Appeal Br. 17).

Thus, we frame the § 103(a) issues:

Did the Examiner appropriately characterize Weber as analogous art?

Would each of the above limitations argued by Appellants have been taught or suggested by the combination of Weber and Baldeschwieler such that the claimed invention as a whole would have been obvious to one of ordinary skill in the art?

Finally, were Appellants "first to recognize" and solve the problem of actual array patterns diverging from target patterns and, if so, does that fact rebut any prima facie case of obviousness?

Findings of Fact:[4] *Claim Interpretation*

1. The term "target pattern" or "target array pattern" is not expressly defined in the Specification and thus includes any predetermined plan for

[4] Findings of Fact are abbreviated "FF."

making the microarray, such as a specification, and includes "predetermined configurations" admittedly "known" in the art (*see* Spec. 1, ll. 11-14).

2. The term "halting" as used in claim 20 is not expressly defined in the Specification and thus includes any interruption of or delay in the dispensing operation of sufficient length to rectify the claimed "error condition."

3. The terms "medium" and "remote user" used in claim 18 are not defined in the Specification and thus include any medium, e.g., paper (Spec. 25, l. 23) or an electronic medium, and a user at a computer terminal, respectively. As the term "remote" is undefined and the claim does not give any reference point, we find this term is so broad as not to provide a meaningful limitation.

4. The claim term "processor" includes a computer (Webster's Ninth New Collegiate Dictionary 938 (1990)).

5. In apparatus claims 25-38 and 42, the limitation "an imaging system to capture an image of an actual pattern of dried spots" (claim 25) recites an intended use and thus is satisfied by disclosure of any imaging system capable of performing the intended use (*see* Answer 5).

6. In apparatus claims 46-48, the limitation "the control processor: loads the dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid" (claim 46) recites an intended use and thus is satisfied by disclosure of any control processor capable of performing the intended use (*see* Answer 9).

7. In all apparatus claims, "an image capturing system can include any system which can provide spatial information as to the location of dried spots" (Appeal Br. 19).

Findings of Fact: Weber, Baldeschwieler, and Relevant General Knowledge

8. Microarray production companies were innovating with concepts borrowed from printer technology as early as 1998. (*See, e.g.*, Industrial Technology Research Institute News Release "Implementation of Phalanx Microarray Technology—Fruition of ITRI's Multidisciplinary Effort in Biotechnology," www. Itri. Org.tw/eng/news/spotlight-show.jsp?path-f-20030409.dcr; ArrayJet History, www.arrayjet.co.uk/about.html; and Shimadzu Biotech Press Release October 2001, "Proteome Systems and Shimadzu Biotech Complete 1st Stage of the Chemical Printer Development," www.shimadzu-biotech.net/pages/news/1/press_releases/2001_10_a_proteome.php.)[5]

9. Prior art "arrays include regions (sometimes referenced as spots or features) of *usually* different sequence polynucleotides arranged in a *predetermined configuration* on a substrate" (Spec. 1, ll. 11-14 (emphasis added)); and "[t]ypical procedures known in the art for deposition of polynucleotides, particularly DNA" include loading the DNA "into a drop dispenser in the form of an inkjet head" (Spec. 2, ll. 10-19).

10. Further, Baldeschwieler utilizes an ink jet device to deliver microdrops (Baldeschwieler col. 6, ll. 41-43), as do Appellants (Spec. 13, ll. 13-14).

11. Thus, it would have been reasonable for one skilled in the art to look to the field of printer technology at the time of Appellants' claimed invention, including the Weber reference, and one skilled in the art would have been motivated to combine the two references with a reasonable

[5] Copies of these references are provided with this opinion.

likelihood of success (FF 9, 10; *see also* FF 8 (which provides historical perspective but is not needed to support this finding)).

12. Baldeschwieler discloses a method and apparatus useful for fabricating an array of polynucleotides on a substrate which includes operating a polynucleotide deposition system to deposit an array of polynucleotides containing fluid droplets on the substrate in accordance with a target array pattern, observing the actual pattern, and comparing it with the target pattern (col. 4, ll. 59-63; col. 6, l. 41 to col. 7, l.1; col. 8, l. 14 to col. 9, l. 2).

13. In the disclosed method, Baldeschwieler dispenses "microdrops ... [of] the same or a different reagent" and then repeats this step to form a plurality of loci on the substrate (col. 2, ll. 15-19), suggesting using the same reagent in multiple dispensers when multiple dispensers are used (FF 16).

14. Baldeschwieler notes that "[d]etection of loci . . . may be performed by conventional methods such as fluorescence" (col. 3, ll. 36-37); Weber studies the optical properties of ink spots, including reflection, a form of light scattering (col. 2, l. 64 to col. 3, l. 2); these teachings evidence that various optical methods of visualizing polynucleotides in microarrays, including those recited in Appellants' claims, were known in the art.

15. According to Baldeschwieler, the "preferred ink jet devices utilized to deliver the microdrops generates addresses less than 100 microns across, and address sizes as small as 10 microns" and, by "employing a multiple jet device the synthesis of complete arrays can proceed four times faster" (col. 6, ll. 41-49).

16. Baldeschwieler's FIG. 2 discloses multiple dispensers 22 "with the flow of the reagent" into the dispensers from the reagent reservoir "being controlled by a flow controller 27" (col. 8, ll. 23-29).

17. Baldeschwieler further discloses their "ink-jet device was controlled by C/C++ program ASyn, with a Windows interface incorporated such that nearly all functions can be done with a mouse" (col. 9, ll. 25-27).

18. Baldeschwieler uses a "video camera, *which translates in x and y with the jet*, . . . positioned above the slide to monitor drop ejection by focusing on the lower slide surface [or] the camera could be rotated to view across the jet nozzle" (col. 9, ll. 19-24 (emphasis added)), at least suggesting the camera is or could be "mounted for movement by the transporter" (claim 39).

19. Weber describes "problems which have been encountered" in ink jet printing relating to "the existence of the ink droplet, the position of the droplet, the size of the droplet and the property or condition of the ink spot on the record media" (col. 1, ll. 29-33).

20. An additional problem noted by Weber is that "the precise optical properties of the ink spot . . . may not be within the scope of the specification" (col. 2, ll. 64-67), inherently disclosing a comparison between the actual pattern and the target pattern, or specification.

21. Weber's disclosed system, an optical sensing device, is designed to identify and correct such problems (col. 8, ll. 43-51).

22. Weber's "optical sensing device is preferably a sensing unit associated with the printing element or print head and movable therewith and is capable of detecting the actual position of the ink mark or spot on the paper" (col. 3, ll. 16-19).

23. When Weber's optical sensing device recognizes an "error condition in the proper printing operation . . ., the optical sensing device may initiate" cleaning the dispenser or "a change or alteration of the ink droplet drive means or the operation thereof to correct the printing of the characters" or, if such changes or alterations are not "possible to effect correction . . . , an alarm or like audible tone would be generated to notify the operator . . ." (col. 3, ll. 26-34).

24. In Weber's device, "the consequence of a misplaced ink spot or dot can effect the release of a cleaning agent . . . [or] a scraping or like cleaning of the nozzle plate" but, if these procedures "do not correct the printing operation, an alarm can be connected to the sensing device to indicate the trouble condition" (col. 5, ll. 14-20).

25. In order to perform the described cleaning or scraping operation described by Weber, the program would have to halt or delay operation of the dispensing system in order to address the problem (*see* Answer 7; FF 23-24; col. 8, ll. 4-8 ("delay of the excitation pulse . . . is dependent upon . . . the error signals")).

26. It would have been an obvious variation on Weber's teachings to halt the dispensing operation if initial efforts to correct an error failed, along with sounding the alarm or, alternatively, to sound the alarm at the time the error was initially detected rather than only when initial efforts to correct the problem failed.

27. If cleaning failed to correct a dispenser problem, as disclosed in Weber, the obvious solution would be to replace the faulty dispenser or avoid its use (FF 23; *see also* Answer 8).

28. Throughout Weber's disclosure, he uses "spot," "dot," or "mark" when referring to comparing the actual ink spots deposited on the substrate with those desired, or specified, and uses "droplets" when referring to the ink being dispensed (*see, e.g.,* FF 19, 20, 22, 24: Answer 7).

29. While drops of ink from a fountain pen may not dry immediately, Weber is discussing very small droplets from an ink jet head which the skilled artisan would have expected to dry very quickly, if not on impact (see FF 15 (ink jet head dispenses very small sizes)).

Discussion of the § 103(a) Rejection Based on Weber and Baldeschwieler

Based on the above findings and those of the Examiner, we draw the following conclusions:

(1) Weber is clearly analogous art and appropriately combined with Baldeschwieler (FF 9-11; Answer 3; *see also KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 ("When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or in a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.));

(2) The combination would have taught or suggested the limitations of claims 1-18 and 20-48 argued by Appellants and thus the claimed invention as a whole would have been obvious to one of ordinary skill in the art (FF 1-29; Answer 3-10); and, finally,

(3) Appellants were not "first to recognize" the problem of actual array patterns diverging from target patterns or the first to address such problems (*see* FF 19-25, 32, 41, 42; Answer 4-5). Thus, their relied-upon recognition and solution are not sufficient to rebut the Examiner's prima

facie case of obviousness. *See KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 1742 (2007) (obviousness can be established by showing "there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims").

With respect to method claims 1, 10, 11, 20, 23, and 24-25, Weber inherently discloses "allowing a sufficient time to pass such that droplets deposited by the system will have dried to yield an actual pattern of dried spots" and "comparing the actual pattern [of dried spots] with the target pattern" (FF 20, 28-29; Answer 3-4).[6]

The additional limitations in method claim 10 ("imaging a light scattering characteristic of dried spots"), claim 11 ("imaging a fluorescence characteristic of dried spots"), claim 20 ("automatically halting further operation of the deposition system" when an "error condition" is detected), claim 23 ("the control processor loading the dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid"), and claim 24 ("altering the initial pattern" such that a dispenser identified as faulty "is not used") are also taught or suggested by the prior art (FF 12, 14, 16, 17, 23-27; Answer 6-9).

Likewise, Appellants fail to identify any limitations recited in apparatus claims 25, 39, and 46 that would lend patentability to these claims. The limitations in claim 25 ("an apparatus comprising an imaging system to capture an image of an actual pattern of dried spots"), claim 39 ("the imaging system that includes a light receiving element mounted for

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[6] Claim 18 does not contain the "dried spot" limitation but is included to track the claim grouping relied upon by Appellants. In fact, Appellants offer no argument why claim 18 would have been non-obvious over Weber and Baldeschwieler.

movement by the transporter"), and claim 46 ("an apparatus . . . wherein the control processor loads the dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid") are taught or suggested by the combination of Weber and Baldeschwieler (FF 5, 6, 18; Answer 5-6, 9).

Thus we affirm the Examiner's § 103(a) rejection of claims 1-18 and 20-48 based on Weber and Baldeschwieler.[7]

The § 102(a)/§ 103(a) Rejection Based on Graves

The Issues

With respect to claims 10, 11, 23 and 43-45, 24, 25-38 and 42, 39 and 40, and 46-48, Appellants dispute the same limitations as those disputed with respect to the rejection based on Weber and Baldeschwieler (*see* Appeal Br. 26-32; *supra* pp. 5-6 (Appellants' arguments numbered 2, 3, and 5-9)). Notably and appropriately, Appellants do not argue that Graves does not disclose "dried spots" (see Graves, at 5090 (rhc) ("spot visual density is nonuniform" because of "unequal evaporation during drying" of test ink spot); *id.* at 5090-91 (lhc) (recognizing "nonuniform spreading of the [oligonucleotide] droplets")).

With respect to claims 1-9, 12-18, 21-22, and 41, Appellants argue Graves does not "teach or suggest a polynucleotide deposition system operated to deposit an array of polynucleotide containing fluid droplets on the substrate in accordance with a target array pattern determined by a processor in communication with the deposition system" (Appeal Br. 26).

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[7] Claims 2-9, 12-18, 21, 22, 26-38, 40-45, and 47-48 are not argued separately. Thus, they stand or fall with the argued claims. 37 C.F.R. § 41. 37 (c)(1)(vii)(2006).

Also as to this group of claims, Appellants argue: "Graves . . . fails to teach or suggest . . . forwarding the array and medium to a remote user (Claim 18); the fluid dispensing head with multiple drop dispensers (Claim 21); and the control processor's comparing and evaluating function when multiple error indications are generated (Claim 23)" (Appeal Br. 25).

With respect to apparatus claims 25-38, and 42, Appellants argue Graves does not "teach or suggest an apparatus comprising an imaging system to capture an image of an actual pattern of dried spots" (Appeal Br. 26).

Based on these arguments, we frame the § 102(b)/§ 103(a) issues: (1) Does Graves disclose each limitation of the disputed claims, either expressly or inherently; and (2) Would the claimed invention, including the disputed limitations, have been obvious to the artisan of ordinary skill based on Graves' teachings?

Findings of Fact: Graves and the Knowledge of the Skilled Artisan

30. Graves' teachings are directed to "the construction and operation of an arrayer system to produce patterns of DNA sequences" (Graves, at 5085 (abstract) with "'off-the-shelf' items . . . that were easy to interconnect and assemble" (id. (rhc[8])).

31. Graves discloses a computerized method of fabricating an array of polynucleotides on a substrate which includes depositing "controlled volume microdroplets on a series of glass slides in precise locations" (Graves at 5085 (rhc)); therefore Graves inherently discloses or at least

[8] We use "rhc" and "lhc" as abbreviations for right hand column and left hand column, respectively.

suggests computerized loading of the dispensers "in a pattern," i.e., with "at least some of the dispensers . . . loaded with the same fluid."

32. Graves recognizes the challenges of obtaining "reproducibility of deposition" (*id.* at 5090-91), controls deposition with a computer (*e.g.*, Abstract, *id.* at 5086 (rhc)), presumably and necessarily programmed to deposit a predetermined pattern, and compares the pattern of a first array to a second to determine reproducibility (see Answer 10).

33. Graves discloses an imaging system, i.e., a "video camera" and "video microscope," and the visualization of "fluorescently tagged DNA or RNA" (id. at 5085 (lhc); 5086 (lhc); Fig. 7).

34. Graves imaging system would be capable of "captur[ing] an image of an actual pattern of dried spots" (*see* FF 7; Answer 11).

35. Graves uses a video camera to monitor the droplet deposition process (*id.* at 5086 (lhc) and to compare an image of the actual pattern of a second array deposition with that of a first to determine reproducibility (*id.* at 5090-91).

36. Graves' video camera does not move with the unit, as required by claim 39, but rather is "mounted in [a] permanent location[] on a fixed overhead rail" (*id.* at 5086 (lhc)); however, Graves suggests that a moving video camera had been or could be used with a unit other than their X,Z unit, such as that of Brown (*id.*), or Baldeschwieler (*see* FF 18).

37. Graves discloses the use of multiple dispensers to "increase speed significantly for large arrays" (*id.* at 5090 (lhc); *see also id.* at 5088 (lhc) (four deposition needles)); one skilled in the art would have known to use these multiple dispensers to dispense the same fluid or different ones

depending upon the experiment to be conducted (*see, e.g.*, Graves, Figure 7(a) (all spots are the same fluid (ink)); FF 13).

38. Thus, Graves inherently and necessarily discloses computer-controlled loading of such dispensers as the fluid is dispensed under the control of a computer (FF 37).

39. The information generated by the computer in Graves, including the array, would have been communicated to a "remote user" via a computer terminal (Graves, Figure 1; *see also* Figure 7 (disclosing the type of image that would have been communicated to the user)).

40. Graves does not expressly or inherently disclose a computer "the control processor loading [multiple] dispensers in a pattern in which at least some of the dispensers are loaded with the same fluid" or "generating an error indication" or "when multiple error indications are generated," evaluating the cause of the errors, as required by claim 23, or "altering the initial pattern such that the same [faulty] dispenser is not used," as required by claim 24.

41. However, Graves recognizes possible errors (*id.* at 5090-91); thus, the skilled artisan would have known how to automate error detection and evaluation, given the advanced state of fabrication automation (*see id.* at 5085 (lhc) ("theory and applications of this technology are well known")) and would have known to avoid using a faulty dispenser, once identified, and how to do so.

42. Like Weber (FF 28), Graves uses "droplets" to refer to dispensed liquids and "spots" to refer to spots on the microarray, at least suggesting the spots are dried prior to imaging, consistent with Graves recognition of

"nonuniform spreading" of oligonucleotides (*see* Graves, at 5090-91 & *passim*).

Discussion of Anticipation under § 102(b)

Based on our findings and those of the Examiner, we affirm the Examiner's § 102(b) rejection of claims 1, 10, 11, 18, 21, 25, and 46, as anticipated by Graves (FF 1-7, 30-39; Answer 10-13). Appellants grouped claims 2-9, 12-17, 22, 26-38, 41, 42, and 47-48 with these claims. Thus, we also affirm their rejection under § 102(b). *See* 37 C.F.R. § 41.37 (c)(1)(vii) (2006).

However, we find Graves does not expressly or inherently disclose all the limitations of claims 23, 24, and 39 (FF 36, 40) and thus reverse the anticipation rejection of these three claims. We also reverse the § 102(b) rejection of claims 40 and 43-45, those argued with claims 23 and 39 and reciting the same limitations not expressly or inherently disclosed by Graves.

Discussion of Obviousness under § 103(a)

Based on our findings and those of the Examiner, we affirm the Examiner's § 103(a) rejection of claims 1, 10, 11, 18, 21-25, 39, and 46[9] (FF 1-7, 30-39, 41; *see also* Answer 10-13). While Graves does not anticipate claims 23, 24, and 39, the subject matter of these claims would have been obvious to the skilled artisan in view of Graves' teachings and suggestions and the general knowledge in the art (see FF 39, 41). Claims 2-9, 12-17, 22,

[9] Again, we note the Examiner has withdrawn the rejection of claim 20 based on Graves (Answer 12).

26-38, 40-45, and 47-48 were not argued separately and thus fall with these claims.

In this case, "there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims." *KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 1742 (2007). While Appellants argue they were the first to discover the potential problems created by droplets, the record belies this claim (*see* FF 19-25, 32, 41-42). Once the problem was recognized (as it was), the solution would have been obvious to the person of ordinary skill in the relevant art.

Further, in addition to relying on their problem and solution, Appellants also rely on numerous aspects of microarray technology well known in the art (*see, e.g.*, FF 1, 9, 14, 16, 41). Such aspects cannot lend patentability to an otherwise unpatentable claim, absent a showing of unexpected results. *See KSR Int'l*, 127 at 1740 ("when a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious")).

CONCLUSION

We affirm the § 103(a) rejection based on Weber and Baldeschwieler with respect to all appealed claims, i.e., claims 1-18 and 20-48;

affirm the § 102(b) rejection based on Graves with respect to claims 1-18, 21, 22, 25-38, and 40-48;

reverse the § 102(b) rejection of claims 23, 24, and 39; and

affirm the § 103(a) rejection based on Graves with respect to claims 1-18, and 21-48.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(2006).

AFFIRMED

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